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ABSTRACT

Presented is a study designed to analyze nine journals that contain substantial material devoted to the field of science education for the period 1970 through 1971: "American Journal of Physics," "Chemistry," "Journal of Chemical Education," "Journal of Research in Science Teaching," "Physics Today," "School Science and Mathematics," "Science and Children," "Science Education," and "The Science Teacher." Analyses were made of such factors as type of articles published, length of articles, and geographic origin of the article. This information was considered to serve as base-line data for determining gaps in the science education literature and for making recommendations with regard to areas for research and dissemination of information. A total of 2,093 articles of an average length of 2,607 words were published in the nine journals for the period under analysis with the number of articles being about equally divided between the two years. Contributors represented over 500 different schools, with these being primarily colleges and universities. Articles related to science education for preschool, kindergarten, and junior high school groups had limited representation in journals during the period surveyed. A geographic representation of authors for the period was as follows: northeastern U.S., 24.7 percent; southeastern, 17.8 percent; central, 23.2 percent; southwestern, 8.2 percent; and far western, 13.5 percent. (Author/PEB)

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ANALYSIS OF THE CURRENT LITERATURE OF SCIENCE EDUCATION

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The growth of the literature of science education has been rapid in the last decade. This growth has led to many changes in the scope of existing journals and the addition of new ones. For example, in 1963 the Journal of Research in Science Teaching, The Physics Teacher, and Science and Children first appeared, and in 1971 the Journal of College Science Teaching was added to the world's literature of science education. These journals, as well as those that have been published for a number of years, serve as a very vital means for the dissemination of information in such areas as original research in science teaching, methods of teaching science, and the philosophy and history of science education.

Numerous studies have been made in recent years of the growth of the world's journal literature in such areas as chemistry,[1,2]

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[1]Miner, W. N. "Plutonium - The Development of Its Literature", Journal of Chemical Documentation, IV (February 1964), 20-25.

[2]Ayers, Jerry B. "Journal Articles Related to the Transplutonium Elements", Journal of Chemical Documentation, XII (February 1972), 23-26.

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chemical education[3] and educational research.[4,5] However, a detailed review of the literature revealed no studies related

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[3] Ayers, Jerry B. "The Journals of Chemical History, Education, and Documentation," Journal of Chemical Documentation, XI (February, 1971), 12-13.

[4] Nelson, Carnot E. "The Communication System Surrounding Archival Journals in Educational Research," Educational Researcher, I (September, 1972), 13-16.

[5] Nelson, Carnot E. "Journal Publication of Materials Presented at an Annual AERA Meeting," Educational Research, I (August, 1972), 4-6.

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to an analysis of the current literature of science education.

PURPOSE

The purpose of this present study was to analyze nine journals that contained substantial material devoted to the field of science education for the period 1970 through 1971. Analyses were made of such factors as the type articles being published, scope of the articles, author affiliation, length of the articles, and geographic origin of the article. This information can serve as base line date for determining gaps in the science education literature and for making recommendations with regard to areas for research and dissemination of information. It should be pointed out that no attempt was made to analyze the numerous

reports and publications that are available through such agencies as scientific and professional associations or through the ERIC system.

METHODOLOGY

Nine journals that devoted substantial space to the field of science education and were published during the calender years of 1970 and 1971 were chosen for this study. The following journals were included in this study: American Journal of Physics (Am. J. Phy.), Chemistry (Chem.), Journal of Chemical Education (J. Chem. Ed.), Journal of Research in Science Teaching (J. Res. Sci. Teach.), Physics Today (Phys. Today), School Science and Mathematics (Sch. Sci. & Math.), Science and Children (Sci. & Child.), Science Education (Sci. Ed.), and The Science Teacher (Sci. Teach.). A detailed study was made of each issue of these journals that was published between January 1970 and December 1971, i.e., a two year period. A tabulation was made of the number of articles that appeared in each of the journals during this period (it should be noted that the number of articles was about equally divided between 1970 and 1971). The articles were categorized on the basis of the level for which they were written (pre-school, elementary, junior high, senior high, college, and other). A tabulation was made of the number of articles that fell into five subject categories and included: research in teaching science education; pure research (such as reports of original scientific research); methods of teaching science; philosophy and history of science

education; and a fifth category of other articles which included such items as summaries of professional meetings, editorials, and book reviews.

A summary was made of the average length of the articles that appeared in each of the journals in terms of the number of words. It should be noted that space taken up by figures, diagrams, and photographs was converted to equivalent words and used in computing the averages. Author affiliations were summarized into four categories: below the college level, colleges and universities, industry, and other. This later category included articles prepared by government workers, employees of professional and scientific organizations, or papers that did not list a specific author such as news articles, editorials, and similar items. A summary was made of the geographical residences of the authors, i.e., northeastern section of the United States, southeastern, etc.

RESULTS AND DISCUSSION

Results of the study revealed that there were a total of 2,093 articles of an average length of 2,607 words published in the nine journals during 1970 and 1971. The number of articles were about equally divided between the two years. Making allowance for pictures, figures, and tables, in terms of equivalent words, it is estimated that more than 6,279,000 words were devoted to science education in the two year period. Table I shows a summary of the number and average length of the articles

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published in each of the journals.

Analysis of the articles in terms of the school level for which they were written, revealed that eight (0.4 percent) were intended for the kindergarten or pre-school level. The majority of these articles were found in Sci. & Child. A total of 87 articles (4.2 percent) and 244 articles (11 percent) were associated respectively with science instruction in grades 1-6 and 7-12. These articles were generally found in Sch. Sci. & Math., Sci. & Child., Sci. Ed., and Sci. Teach. The majority of the articles (476 or 18.6 percent) related directly to college level instruction were found in Am. J. Phy., Chem., J. Chem. Ed., J. Res. Sci. Teach., Sch. Sci. & Math., Sci. Ed., and Sci. Teach. The bulk of the articles (1,288 or 61.5 percent) were put into a category classified as "other" and included a variety of items such as editorials, meeting summaries, and book reviews. In some cases the articles were applicable to all grade levels from pre-school through college. In summary the more specialized subject matter journals such as Am. J. Phys., J. Chem. Ed., J. Res. Sci. Teach., Phys. Today, and Sci. Ed. tended to carry more articles oriented toward college level teaching, while journals such as Sch. Sci.& Math., Sci. & Child., and Sci. Teach. emphasized science teaching below the college level. In general the length of the

Table I. Number of Articles in Each Journal During 1970 and 1971 and Average Length in Words

Journal	No. of Articles	Average Length
Am. J. Phy.	410	2,998
Chem.	80	1,843
J. Chem. Ed.	612	1,872
J. Res. Sci. Teach.	102	4,551
Phys. Today	84	4,669
Sch. Sci. & Math.	258	2,953
Sci. & Child.	123	2,165
Sci. Ed.	149	2,957
Sci. Teach.	275	2,215
Totals	2,093	2,607

articles in the more specialized subject matter journals were longer than in the less specialized journals.

The articles from the nine journals were categorized into five areas that included: research in science teaching; pure research, including original scientific research; applications or methods of teaching science; philosophy and history of science education; and other areas including such items as book reviews, meeting summaries, and editorials. Table II shows a summary of

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the number of articles categorized in each of the five areas from the journals. About 10.2 percent of the articles were concerned with research in teaching and 13.0 percent with other research. The articles were about equally divided, on a percentage basis, between the nine journals. Over 37.5 percent of the articles in the journals were oriented toward methods of teaching science. There appeared to be an abundance of articles related to instruction of science at the high school and college level. However, there was a dearth of articles dealing with science methods at the elementary and junior high levels. Articles dealing with the philosophy and history (152 or 7.3 percent) were about equally divided, on a percentage basis, among the journals and at the various grade levels, pre-school through college. About one-third of the articles were such items as meeting summaries,

Table II. Type of Article by Journal

Journal	Research in Teaching	Pure Research	Methods	Philosophy and History	Other
Am. J. Phy.	20	30	196	25	139
Chem.	1	14	16	28	21
J. Chem. Ed.	61	94	202	24	231
J. Res. Sci. Teach.	20	14	38	5	25
Phys. Today	3	5	32	17	27
Sch. Sci. & Math.	35	20	117	15	71
Sci. & Child.	35	10	30	10	38
Sci. Ed.	14	12	71	19	33
Sci. Teach.	24	73	83	9	86
Totals	213	272	785	152	671
Percentages	10.2%	13.0%	37.5%	7.3%	32.1%

editorials, and book reviews. These items in some cases could possibly be classified into one of the aforementioned areas.

Analysis of the professional affiliations of the authors of the articles (Table III) revealed that 7.3 percent were associated with schools or school systems below the college level.

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Sci. & Child. and Sci. Teach. contained the highest percentage of articles by these authors. Over 77.2 percent of the articles were prepared by authors affiliated with colleges and universities. The highest percentages were in Am. J. Phy., J. Chem. Ed., Sch. Sci. & Math., and Sci. Ed. The majority of the articles (5.2 percent) by authors from business and industry were found in Am. J. Phy., Phys. Today, and J. Chem. Ed. About 10.3 percent of the articles were prepared by authors associated with agencies such as the Office of Education, professional and scientific organizations, or no author affiliation was listed.

Analysis of the number of different colleges and universities, with which the authors were affiliated, revealed that the contributors represented over 500 different schools. Some of the most productive colleges and universities during the time period covered by this study were the University of Texas, Ohio State University, and schools located in California and Michigan.

Examination of the geographic areas from which the articles originated showed that 24.7 percent were from authros located in

Table III. Professional Affiliations of Authors

Journal	School Below College Level	College or University	Industry	Other
Am. J. Phys.	1	359	33	17
Chem.	8	49	6	17
J. Chem. Ed.	5	562	27	18
J. Res. Sci. Teach.	1	96	0	5
Phys. Today	0	50	20	14
Sch. Sci. & Math.	24	205	1	28
Sci. & Child.	30	67	5	21
Sci. Ed.	12	125	2	10
Sci. Teach.	72	103	15	85
Totals	153	1,616	109	215
Percentages	7.3%	77.2%	5.2%	10.3%

the northeastern part of the United States, 17.8 percent from the southeast, 23.2 percent from the central area, 8.2 percent from the southwest, and 13.5 percent from the far west. Over 12.6 percent of the articles were from foreign contributors (mostly from English speaking countries), with the highest publication rates being in the Am. J. Phy. and J. Chem. Ed. These two journals contained over 77 percent of all of the articles from foreign contributors.

CONCLUSIONS AND RECOMMENDATIONS

This paper has presented a summary of some relevant information concerning the dissemination of information about science education. It is obvious that the study is limited in scope in that only nine journals were examined in depth. However, it is estimated that these journals contained a majority of the English language articles dealing with the topic of science education. During the period of this study only a limited number of articles directly related to pre-school and kindergarten science education were published. It would appear, with the current emphasis in this area, that every consideration should be given to dissemination of science education information for this level. Materials related to science insturction at the elementary level, senior high and college levels were abundant. However, there were only a limited number of articles specifically related to junior high school science instruction. Again, with the current interest at this level, there appears to be a need for additional articles.

There appeared to be a dearth of articles related to research and methods of teaching science at the lower levels in the schools, i.e., pre-school through about grade 9. Again, it is recommended that consideration be given to additional articles at this level and on these topics. There is a definite need to make the articles related to research in teaching science education of interest and value to the practicing teacher. In many cases the needs of the classroom teachers are not being met.

The majority of the articles prepared in the area of science education came from authors affiliated with colleges and universities. There is a need to encourage teachers and others closely associated with the classrooms in grades K-12 to prepare articles for publication. These individuals can give valuable assistance to their own colleagues, as well as the college level individuals by dissemination of first hand information from the classrooms. These individuals can tell the true story of what is happening in the classroom with regard to instruction in science education. Geographically, the majority of the papers were prepared by authors living in the eastern half of the United States. This factor is probably due to the high population concentration in this section of the country.

In summary this paper has presented some statistical information related to the publication of articles in science education. It is hoped that by the presentation of this paper that other individuals in science education can be encouraged to publish and share their work with others. In turn, the end result can be better teaching at all levels.